

CLAIMS

What is claimed is:

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1. A method of storing data values in a multidimensional database comprising:
identifying a plurality of dimensions, wherein each of the dimensions is
indicative of a plurality of storage locations;
identifying a hierarchy of attributes within at least one of the dimensions,
wherein the hierarchy is indicative of an association between the attributes;
attributing a plurality of data values to each of the attributes; and
storing the data values on a storage medium based on the data values
indicated by the hierarchy.
 2. The method of Claim 1 wherein the data values are stored on the storage
medium in proximity to associated data values, wherein the associated data
values are attributed to associated attributes as indicated by the hierarchy.
 3. The method of Claim 2 wherein the data values further comprise aggregate
values and detail values.
 4. The method of Claim 3 wherein each of the aggregate values includes at least
one of other data values.
 5. The method of Claim 3 wherein the aggregate values comprise at least one detail
value.
 6. The method of Claim 3 wherein the aggregate values further comprise at least
one data value selected from the group consisting of aggregate values and detail
values.
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7. The method of Claim 3 wherein the association is a parent-child association between an aggregate value and at least one child data value.
 8. The method of Claim 3 wherein the association is between an aggregate value and at least one data value.
 - 5 9. The method of Claim 3 wherein the hierarchy defines a plurality of levels, wherein each of the aggregate values on one level includes the data values on a successive level.
 - 10 10. The method of Claim 9 wherein the association is an inclusion of the plurality of data values in the aggregate value.
 11. The method of Claim 3 wherein each of the data values associated with an aggregate value are stored proximate to the other data values associated with the same aggregate value as indicated by the hierarchy.
 12. The method of Claim 11 wherein the proximate values are stored adjacently.
 - 15 13. The method of Claim 3 wherein storing further comprises storing the aggregate value on the storage medium adjacent to the associated data values.
 14. The method of Claim 13 wherein the storage medium further comprises storage segments, wherein the data values in a storage segment are manipulated concurrently.
 - 20 15. The method of Claim 14 wherein the storage medium is a disk cache and the storage segments are cache pages corresponding to pages on a disk.

16. The method of Claim 15 wherein storing the proximate data values further comprises storing the data values on a common cache page.
17. The method of Claim 14 wherein the storage medium is a disk and the storage segments are disk pages.
- 5 18. The method of Claim 17 wherein the storing the proximate data values further comprises storing on a common disk page.
- 10 19. The method of Claim 3 further comprising the steps of:
aggregating at least one of the dimensions having a hierarchy by
traversing each of the aggregate values included in the dimension; and
including, in an aggregation total, the associated data values
corresponding to the aggregate value.
- 15 20. The method of Claim 19 wherein aggregating includes:
traversing, for a first aggregate value on a first level, each of the data
values on a second level associated with the aggregate value; and
subsequently traversing each of the other aggregate values on the first
level via traversing the data values on a second level associated with the
subsequent aggregate value.
- 20 21. The method of Claim 20 wherein traversing further includes
fetching, from the storage medium, a storage segment having data values
corresponding to the aggregate value, wherein each of the corresponding data
values are stored in an adjacency.
22. The method of Claim 21 wherein the storage segment is a memory cache page.

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23. The method of Claim 21 wherein the storage segment is a disk page.

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24. A system for storing and accessing a multidimensional database comprising:
a memory having a cache and an database engine;
a mass storage device in communication with the memory and operable
to store a plurality of data values;
a kernel included in the database engine, wherein the kernel is operable
to manipulate data values between the memory, the cache, and the mass storage
device; and
a sparsity manager included in the database engine, wherein the sparsity
manager is operable to determine a storage organization of the data values from
a predetermined hierarchy.

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25. The system of Claim 24, wherein the data values further comprise aggregate
values and detail values as defined by the predetermined hierarchy.

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26. The system of Claim 25 wherein the aggregate values are further comprised of
aggregate values and detail values.

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27. The system of Claim 26 wherein the aggregate values are further comprised of
other data values.

28. The system of Claim 25 wherein the hierarchy further defines levels, wherein the
aggregate values on a first level comprise data values on a second level.

20 29. The system of Claim 25 wherein each of the aggregate values is associated with
at least one of other data values as indicated by the hierarchy.

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30. The system of Claim 28 wherein each of the data values associated with a common aggregate value are stored in proximity.
31. The system of Claim 30 wherein the proximity is an adjacency.
32. The system of Claim 30 wherein the mass storage device comprises storage segments, wherein the storage segments are indicative of a set of data values that are manipulated together.
33. The system of Claim 32 wherein each of the data values stored in proximity are stored on a common storage segment.
34. The system of Claim 32 wherein the storage segments comprise disk pages.
35. The system of Claim 32 wherein the storage segments correspond to cache pages.
36. A computer program product having computer program code for storing data values in a multidimensional database comprising:
computer program code for identifying a plurality of dimensions, wherein each of the dimensions is indicative of a plurality of storage locations;
computer program code for identifying a hierarchy of attributes within at least one of the dimensions, wherein the hierarchy is indicative of an association between the attributes;
computer program code for attributing a plurality of data values to each of the attributes; and
computer program code for storing the data values on a storage medium in proximity to associated data values, wherein the associated data values are attributed to associated attributes as indicated by the hierarchy.

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37. A computer data signal having program code for storing data values in a multidimensional database comprising:
- program code for identifying a plurality of dimensions, wherein each of the dimensions is indicative of a plurality of storage locations;
 - 5 program code for identifying a hierarchy of attributes within at least one of the dimensions, wherein the hierarchy is indicative of an association between the attributes;
 - program code for attributing a plurality of data values to each of the attributes; and
 - 10 program code for storing the data values on a storage medium in proximity to associated data values, wherein the associated data values are attributed to associated attributes as indicated by the hierarchy.
38. A system for storing data values in a multidimensional database comprising:
- 15 means for identifying a plurality of dimensions, wherein each of the dimensions is indicative of a plurality of storage locations;
 - means for identifying a hierarchy of attributes within at least one of the dimensions, wherein the hierarchy is indicative of an association between the attributes;
 - means for attributing a plurality of data values to each of the attributes;
 - 20 and
 - means for storing the data values on a storage medium in proximity to associated data values, wherein the associated data values are attributed to associated attributes as indicated by the hierarchy.
39. A method of storing data values in a multidimensional database comprising:
- 25 identifying a plurality of dimensions, wherein each of the dimensions is indicative of a plurality of attributes associated with a data value;

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40. A method of storing data values in a multidimensional database comprising:
- identifying a plurality of dimensions, wherein each of the dimensions is indicative of a plurality of storage locations;
- identifying a hierarchy of attributes within at least one of the dimensions, wherein the hierarchy is indicative of an association between the attributes;
- attributing a plurality of data values to each of the attributes; and storing the data values on a storage medium on the same disk page as associated data values, wherein the associated data values are attributed to associated attributes as indicated by the hierarchy.